US Navy Decompression Tables and Procedures, Part Three

Presented by the NOAA Diving Center

Seattle, Washington

Global View

- Brief SIT
- Safety stops
- Cold or arduous dives
- Ascent variations
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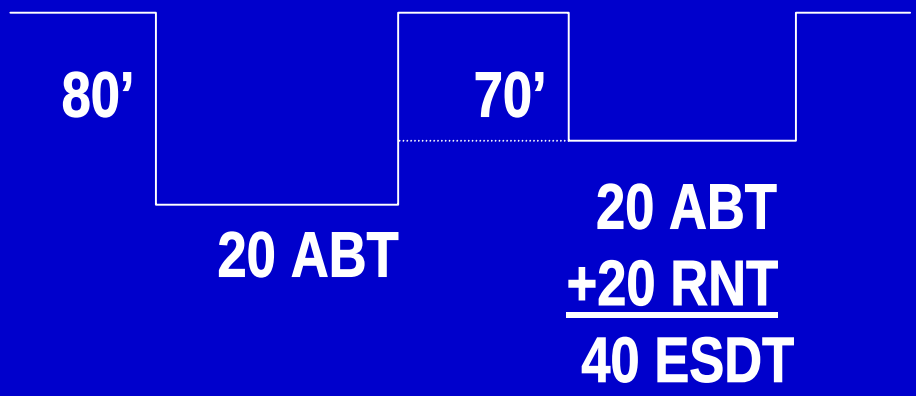
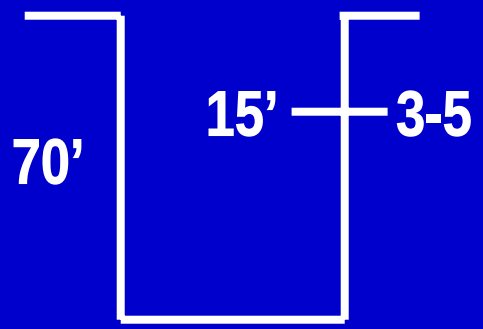
Brief SIT

- If the SIT is less than 10 minutes, the RNT is the bottom time from the previous dive.
- Add the bottom times of the two dives, use the deepest depth attained for the schedule, and ignore the SIT
- Example: 80’/20, SIT = 0:08, 70/20 schedule is 80’/40



Safety Stops

- Definition: Precautionary decompression stops used to compensate for ascent rate variation and individual variations in nitrogen absorption and elimination
- Recommendation: Use for all dives deeper than 60 fsw and/or repetitive dives
- Procedure: Stop between 15 and 20 fsw for 3 to 5 minutes
- Dive table procedure: Safety stop time does not count as either bottom time or SIT
- Safety stop depths are measured from the level of the diver's mouth



Cold or Arduous Dives-1

- Rule: For cold or arduous dives, use the next longer duration for the dive schedule
  - Example: Schedule for a 70’/30 dive that is cold or arduous is 70’/35
- If you cannot use the next longer duration because it places the diver into decompression, use the next less available bottom time
  - Example: Maximum no-deco bottom time allowed for a cold or arduous dive to 70 feet is 45 minutes and the RNT would be figured as if the dive was made for the next greater bottom time (i.e. 50 mins)

Cold or Arduous Dives-2

- When planning a cold or arduous repetitive dive, select the RNT group that is less than the maximum allowable RNT figured for the dive. This will automatically give you a longer SIT
  - Example: You figure the max allowable RNT for a repetitive dive to 60'/30 is 30 minutes. Since you suspect the dive will be cold or arduous you would use 24 minutes as your RNT and follow 60'/55 schedule

Cold or Arduous Dives-3

- Answer:
  - Step 1: Find the max RNT for repetitive dive 60/30 = 30 min
  - Step 2: Since cold or arduous go to next lesser RNT = 24 min
  - Step 3: Move vertically to locate RGD for repetitive dive

15	18	22	25	28	31	34	37	40	GROUP
50	60	70	80	90	100	110	120	130	Letter
6 94	5 55	4 46	4 36	3 27	3 22	3 17	3 12	3 7	A
13 87	11 49	9 41	8 32	7 23	7 18	6 14	6 9	6 4	B
21 79	17 43	15 35	13 27	11 19	10 15	10 10	9 6	8 2	C
29 71	24 36	20 30	18 22	16 14	14 11	13 7	12 3		D
38 62	30 30	26 24	23 17	20 10	18 7	16 4			E

Ascent Variations

- The normal rate of ascent is 30 fpm (2 secs/ft)
- If the rate is less than 30 fpm and the delay exceeds one minute, add total delay time to bottom time and revise dive schedule
- If the rate is greater than 30 fpm, stop ascent for the time that it should have taken to reach the present depth

Diving At Altitude-1

- Ambient pressure decreases with altitude and flying after diving or driving over mountains is risky
- Because of the reduced ambient pressure, dives conducted at altitude require more decompression than identical dives conducted at sea level
- Two different approaches used for altitude diving:
  - Calculate specific decompression tables for use at each altitude
  - Calculate the equivalent sea level depth and use standard decompression tables (i.e. Cross Correction Technique)
- Refer to the section 10.12 NDM for more information on the Cross Correction Technique and altitude diving

Diving At Altitude-2

- The US Navy air decompression tables may be used without correction for dives conducted at altitudes between sea level and 300 feet
- At altitudes between 300 – 1,000 feet, correction is required for dives deeper than 145 fsw (actual depth)
- At altitudes above 1,000 feet, correction is required for all dives
- Diving at altitude requires special training

Flying After Diving-1

- The cabin pressure of a modern, pressurized airplane is normally maintained at an altitude of 8,000 feet
- This reduction in ambient pressure may be sufficient to cause the formation of bubbles following a dive at sea level
- Termination of the flight, which increases the ambient pressure to 1 atmosphere, may not necessarily reduce the size of the bubble enough to relieve the signs and symptoms of DCS, and recompression therapy may be required
- NOAA dive regulations state that the minimum surface interval required before flying after diving shall be in accordance with Table 9-5, *Required Surface Interval Before Ascent to Altitude After Flying*, USN Dive Manual, Revision 4, Jan. 20, 1999

Flying After Diving-2

Required Surface Interval Before Ascent to Altitude After Diving.

Repetitive Group Designator	Increase in Altitude 1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
A	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
B	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	2:11
C	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	3:06	8:26
D	0:00	0:00	0:00	0:00	0:00	0:00	0:09	3:28	7:33	12:52
E	0:00	0:00	0:00	0:00	0:00	0:51	3:35	6:54	10:59	16:18
F	0:00	0:00	0:00	0:00	1:12	3:40	6:23	9:43	13:47	19:07
G	0:00	0:00	0:00	1:23	3:34	6:02	8:46	12:05	16:10	21:29
H	0:00	0:00	1:31	3:26	5:37	8:05	10:49	14:09	18:13	23:33
I	0:00	1:32	3:20	5:15	7:26	9:54	12:38	15:58	20:02	24:00
J	1:32	3:09	4:57	6:52	9:04	11:32	14:16	17:35	21:39	24:00
K	3:00	4:37	6:25	8:20	10:32	13:00	15:44	19:03	23:07	24:00
L	4:21	5:57	7:46	9:41	11:52	14:20	17:04	20:23	24:00	24:00
M	5:35	7:11	9:00	10:55	13:06	15:34	18:18	21:37	24:00	24:00
N	6:43	8:20	10:08	12:03	14:14	16:42	19:26	22:46	24:00	24:00
O	7:47	9:24	11:12	13:07	15:18	17:46	20:30	23:49	24:00	24:00
Z	8:17	9:54	11:42	13:37	15:49	18:17	21:01	24:00	24:00	24:00

Flying After Diving-3

- NOTE 1: When using Table 9-5, use the highest repetitive group designator obtained in the previous 24-hour period
- NOTE 2: Table 9-5 may only be used when the maximum altitude achieved is 10,000 feet or less
- NOTE 3: The cabin pressure in commercial aircraft is maintained at a constant value regardless of the actual altitude of the flight. Though cabin pressure varies somewhat with aircraft type the nominal value is 8,000 feet. For commercial flights, use a final altitude of 8000 feet to compute the required surface interval before flying
- NOTE 4: No surface interval is required before taking a commercial flight if the dive site is at 8000 feet or higher. In this case, flying results in an increase in atmospheric pressure rather than a decrease

Flying After Diving-4

- Example: A diver surfaces from a 60 fsw for 60 minutes no-decompression dive at sea level with a Repetitive Group J. After a surface interval of 6 hours and 10 minutes, the diver makes a second dive to 30 fsw for 20 minutes placing him/her in Repetitive Group C. The diver plans to fly in a commercial aircraft in which the cabin pressure is controlled at 8,000 feet. What is the required surface interval before flying?

Flying After Diving-5

- Answer: The planned increase in altitude is 8,000 feet. Because the diver has made two dives in a previous 24-hour period, he/she must use the highest Repetitive Group Designator of the two dives. Enter the table at 8,000 feet and read down to Repetitive Group J. The diver must wait 17 hours and 35 minutes after completion of the second dive before flying

Omitted Decompression-1

- Should a diver realize that they have exceeded the no-decompression limits prior to reaching the surface, and they do not have access to USN decompression tables to determine required in-water deco time, they should:
  - Stop at 10 – 15 fsw for a minimum of 15 minutes or until they reach 300 psi in their cylinder, which ever comes first
  - Once on the surface they should be placed on oxygen for a minimum of 30 minutes, observed, and restricted from diving for 12 hours
  - If symptoms occur during or after breathing oxygen for 30 minutes, they should be transported (on oxygen) to the nearest medical facility for treatment

Omitted Decompression-2

- Should a diver not realize that they have exceeded the no-decompression limits prior to reaching the surface, or they have insufficient gas to perform in-water decompression, they should:
  - Proceed to the surface at a normal rate of ascent
  - Once on the surface they should notify the divemaster of their omitted decompression
  - If asymptomatic, and the diver can be returned safely to the water within 5 minutes after surfacing, they should dive to the depth of the missed decompression stops and remain for 1½ times the required decompression stop time
  - If the diver cannot be returned to the water within 5 minutes, they should be placed on oxygen for a minimum of 60 minutes

Omitted Decompression-3

- Cont:
  - If asymptomatic after breathing oxygen for 60 minutes, they should be observed for a minimum of 12 hours for signs and symptoms of DCS and restricted from diving during this observational period
  - If symptoms occur during or after breathing oxygen for 60 minutes, they should be transported (on oxygen) to the nearest medical facility for treatment

Note: If a diver is asymptomatic and unable to return to the water to complete omitted decompression, and a recompression chamber is available within 1 hour travel, the diver should be transported to the chamber for possible treatment using USN TT5 or 6

RNT Table Asterisks - 1

- The repetitive groups represent the amount of nitrogen in the 120 min half-time tissue
- If at the end of a surface interval you have a repetitive group that leads you to a double asterisk in the RNT tables (**), it means that the tissue N2 tension in the 120 min tissue is still higher than the inspired N2 tension at this depth
- Therefore, during the dive the 120 min tissue will actually off-gas rather than on-gas resulting in a lower group letter

RNT Table Asterisks - 2

- To avoid publishing separate off-gassing tables for 10 and 20 fsw dives, the USN decided to have their divers assume that the repetitive group does not change during the dive (i.e. it is the same after surfacing as it was when the diver began the descent)
- This is in contrast to normal repetitive dives in which the repetitive group is always greater after surfacing than it was at the beginning of the dive

RNT Table Asterisks - 3

- Example: A diver surfaces as a “G” diver. After 1 hour on the surface the diver becomes a “F” diver. The repetitive dive is to 10 fsw and (**) represents the RNT value from the RNT Table. The dive is for :40. At the completion of the dive and planning for another, RGD “F” would be used to enter into the Surface Interval Table

Key Points

- If the SIT is less than 10 minutes, the RNT is the bottom time from the previous dive
- Safety Stops are recommended for dives >60’ and all repetitive dives
- For cold or arduous dives, use the next longer duration for the dive schedule
- The normal rate of ascent is 30 fpm (2 secs/ft)
- USN Deco Tables can be used without correction to 300 feet elevation